

CHEMICAL ACIDS.

Manufacture of Sulphuric, Nitric, and Muriatic Acids.

The extent of the chemical knowledge acquired at school by most of us was so slight that with regard to acids memory can generally tell us very little indeed, and nine out of ten of us return from the foggy attempt to recall for present use something of the unadvised chemistry of the olden days of school, and burch and terule, with only the vague impression that an "acid" is something sour. Those of us, perhaps, whose literary tastes have led us to the perusal of the "Mysteries of Paris," may recollect the fate of the amiable assassin who, to wash his face in sulphuric acid in order to place himself beyond recognition by the police, and may have a tolerably distinct idea that oil of vitriol (sulphuric acid) is not as great a beautifier for the complexion as the night-blooming cereus and de-ascendron, but beyond this our acidulous chemical knowledge is among the things that were. The object of this article is to show that there is more acid manufactured than is absolutely required by the general public, who desire to burn off their noses and eyelids that they may not be recognized by Detective 12,972 B; and also to tell where and how the acid is made, and for what other purposes it is used.

The three chemical compounds known as "acids," which are so nearly resembling that the one may be substituted for the other in manufactures, and frequently is so substituted; and that salt is nitrate of potash. This is better known to most of us as ordinary saltpetre. The great supply of this material is from the Indies, but of late it has been too expensive to be used in the making of acid, where nitrate of soda could be procured.

The war, which affected every sort of trade and business indirectly, laid its remorseless hand immediately upon this manufacture, and hence it was that the needs of the nations who were desirous of cutting each other's throats and blowing each other's heads off had to be supplied, even if the more quiet pursuits of peaceful men had to suffer thereby. Gunpowder cannot be made without a certain quantity of "villanous saltpetre," and to supply the quantity required by the powder-mills all other trades requiring for their prosecution a medium of this same substance had to suffer, that the killing of men might go on in such a manner that it could be carried on in secret, requiring as it does the use of large quantities of the two active ingredients of gunpowder, the manufacture of chemical acids must needs be attended with danger and conducted with great care. Gunpowder, as is well known, is composed of saltpetre, sulphur, and charcoal. As the latter substance is entirely inert, it follows that the other two are the active agents in making powder the tremendous agent it has ever been. And yet so carefully are these ingredients selected and the chemical works that we have yet to hear of the first accident involving loss of life that has occurred in the United States.

In making sulphuric acid, the principal apparatus consists of certain furnaces, steam-boilers, receiving vats, condensers, and receivers. There is first a long row of furnaces, in the under which three fires are burning. These furnaces are not unlike the ordinary steam-boiler in shape—being long, iron cylinders of perhaps a foot and a half or two feet in diameter, by fifteen feet in length. The sulphur is placed, and a strong fire built in the furnaces immediately underneath. When the sulphur has begun to burn, and also to melt, which it does simultaneously, a number of large iron pots, filled with the nitrate of soda, are introduced into the furnaces, and deposited immediately upon the top and in the midst of the burning mass of sulphur. The fires are kept up to their maximum temperature, and shortly the soda also begins to melt, and at the juncture of the two fusing substances unite into a third variety, distinct from either of the originals, and in this form the dense, heavy gas is led up from the back of the retorts through wide-mouthed pipes into the condensers, which are tanks on the story above. Of these condensers there are, at the present time, two; we saw, two—one, known as the little "tank," is of the diminutive size of twenty-five feet long, twenty-five feet high, and twenty-five feet wide, thus giving a perfect cube-shaped room, capable of containing 15,625 cubic feet of gas. Into this miniature receptacle the vapor from the retorts is first passed; thence it goes by large pipes into the "large tank," which is truly of most formidable dimensions. It is one hundred and fifty feet long, thirty-five feet high, and thirty-five feet wide, thus containing 157,500 cubic feet. Into this huge tank the gas is mixed with heated steam, forced in through pipes, which are set in through the side of the room. In a few minutes after the admission of the steam the gases begin to condense, and the drop from the roof and sides, and to fall in a continuous shower upon the floor. Here it forms a pool about a foot and a half deep, and one hundred and fifty long, affording the most favorable opportunity that could possibly be desired by any enterprising gentleman desiring to take a bath in the real genuine oil of vitriol.

From this floor the acid is drawn off by syphons and put into glass vessels known as "carbonyls," which contain ten to twelve gallons by measure, or about one hundred and twenty-five to one hundred and thirty-five pounds of acid by weight. Any gas which remains uncondensed in the large tank is passed into a tall condenser shaped like a huge chimney, and which is filled with coke. From this condenser it passes also through another filled in like manner, which two are expected to reduce the whole of the gas to liquid form. These tanks and condensers are all lined with sheet-lead, weighing six pounds to the square foot. Lead is the only substance which will perfectly withstand the action of pure sulphuric acid. Even the edges of the various pieces of this leaden lining cannot be fastened with ordinary solder, but must be joined with pure lead. For the same reason there can be no inside supports of metal or wood, as either would be quickly destroyed by the eating action of the acid. Therefore the entire roof of the large tank is built on the "suspension-bridge" plan, and there are no supports or braces whatever inside.

Muriatic acid is manufactured from common salt and sulphuric acid. The process of manufacture is similar to the one already described. The salt is put into cylindrical retorts, which are sealed, all but a small circular hole through which the steam is introduced. The retorts are then kindled, and the gas driven off through a pipe in the back of the retort. This gas is conducted through a long series of glass receivers to the top of the boiling, thence down through a line of similar glass receivers, and into the stone-water receivers, from which the acid is drawn off into the carbonyls for delivery.

Nitric acid is made from nitrate of soda and sulphuric acid, the process being identical with the one last described in every essential particular. The refuse salt which is left from both these processes is sulphate of soda, or the common Glauber's salt, and are sold to make soda ash, which is used to a great extent in the manufacture of glass. Sulphuric acid is largely employed in refining petroleum; in fact, were it not for the cheapness of sulphuric acid, many of the petroleum wells would be worthless, owing to the cost of refining their product, which could not be done so as to pay by cost on a small scale. Nitric acid is largely employed by dyers, and also in the making of percussion-caps, and for many other uses. Muriatic acid is used in large quantities for the purpose of rendering railroad ties and sleepers and railroad bridge timber impervious to moisture. By a peculiar process, and the addition of other materials, muriatic acid is transformed into chloride of zinc, and is, by extended pressure, forced into the pores of timber, the moisture having been previously extracted therefrom. This process so preserves the timber that no amount of exposure to moisture will affect it, nor will insects attack it. At the chemical factories where the above-described acids are manufactured, a number of other important articles are made. Among these are aquafortis, which is simply impure nitric acid, muriate of tin, oxy-muriate of tin, nitrate of iron, nitro-muriate of tin, tin crystals, acetate of the sulphate of soda salts of tartaric acid, aqua ammonia, concentrated aqua ammonia, sulpho-muriate of tin, what is known as "plum spirits," and various other compounds. The greater part of these last-named articles are used almost exclusively by dyers, and with the acids are employed for coloring, bleaching, etc. When first put into the market from the factory, sulphuric acid is worth from four to five cents per pound; nitric acid, fifteen to twenty cents per pound; muriatic acid, four to five cents per pound. The carbonyls or glass demijohn shaped vessels in which the acids are sent to market are always carefully boxed up, to avoid, as far as may be, the danger of breakage, inasmuch as the consequences of breaking a fermentation jug of oil of vitriol on a steamboat deck might not be pleasant. A few years since, a gentleman who spent an evening with old King Whiskey and a few friends, went home to the chemical factory where he was employed to sleep in a room which had a drink from a stone pitcher, filled with what he supposed to be water; it proved, however, to be sulphuric acid. Of course death at once ensued.—Rufus King Browne, M. D.

NOTORIOUS FREEBOOTERS.

Scandinavian Robbers—English Pirates.

An article on "Brigandage" in the last number of the Westminster Review, founded on the recent narratives of Mr. Moon's experiences in Italy, gives a series of curious sketches of notorious freebooters of mediæval and modern times. Two of these stories are as follows:— THE THIRTY ROVERS OF JONSBURGH. "It is impossible to read some of the stories of the old Sea Kings of Scandinavia without feeling admiration for the splendid daring and stoical disregard of life exhibited by those noblest and most romantic of robbers. Take the famous Norse legend of the thirty rovers of Jonsburgh, for instance, who were captured at Hakon's bay, about the year 924. The king had determined to cut off the heads of all his captives, and appointed Thorckell Leire, one of the most famous of the Norwegian chieftains, to act as executioner. The Jonsburgh men were made to sit down before the king on a log wood, each their legs bound together by a rope. Over their heads were twisted in their hair, and a slave stood behind each to keep his head steady. Soon three heads rolled to the ground before the mighty woe of Thorckell's sword. The turn came to the rest of the captives with a mocking smile, the Norwegian chief asked them what they thought of death. 'I only beg of thee,' said one, 'to be quick over my work. Thou knowest it is a question of cut or crushed at the north, whether or not a man feels anything after losing his head. If, after my head is cut off, I throw this knife at thee, that will show that I retain some feeling; if I let it fall, it will prove the contrary. Now strike!' Thorckell did as he said, and, to the surprise of all, the man's head struck the ground, and he fell to the ground from his powerless grasp. 'Strike the blow in my face, said the next; 'I will sit still without flinching. Watch my eye, to see how low to cut; the rovers of Jonsburgh know how to die. The man struck without betraying any emotion. He kept his promise, and received the blow without winking his eyes. 'Then Sigurd, the son of Bol the Thick, a fine young man in the flower of his manhood, with long fair hair as fine as silk flowing in ringlets over his shoulder, then addressed Thorckell:—'I fear not death, but I must pray thee not to let my hair be touched by a slave, or stained with my blood.' Upon this one of Hakon's followers stepped forward and held Sigurd's head in the grasp of the slave; but as Thorckell's battle-axe was whizzing through the air, Sigurd twitched his head forward so strongly that the axe passed him untouched, and cut off both the hands of the warrior who held him. The hero, Hakon saw Sigurd's plight, and he sprang to his feet, and Lis son, Eirik, immediately loosed Sigurd from the rope. Thorckell, however, being determined not to be balked of his prey, now rushed with uplifted axe upon Vagn Alkason, another of the captives, but he was so quick that he threw himself on the ground, so that Thorckell fell over him and cut the rope with his axe. Being thus freed from the bonds which held him, Vagn sprang up, and cut down Thorckell with his own weapon. Eirik then asked Sigurd whether he would accept life from his hands. 'Willingly,' was the reply, 'provided thou wilt give it to all of us.' Upon this the rope was loosened, and the twelve rovers who had escaped death returned to their native rocks. This affair was the most wonderful and fierce of the Jonsburgh men. He sought admittance to the practical community when he was only twelve years old, and when their chief, the celebrated Palnatoki, refused his application on the ground of his youth, Vagn saw Sigurd's plight, and he sprang to his feet, and Lis son, Eirik, immediately loosed Sigurd from the rope. 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